

**OFF-SITE TESTING OF STABILIZED METHANOL FROM THE
LIQUID PHASE METHANOL (LPMEOH™) PROCESS**

TOPICAL REPORT

VOLUME I – TRANSPORTATION SYSTEMS

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**for the
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Abstract

The Liquid Phase Methanol (LPMEOH™) Process uses a slurry bubble column reactor to convert synthesis (syngas) gas to methanol. Because of its superior heat management, the process can directly utilize the carbon monoxide (CO)-rich syngas characteristic of the gasification of coal, petroleum coke, residual oil, wastes, or other hydrocarbon feedstocks. When added to an integrated gasification combined cycle (IGCC) power plant for peak shaving, the LPMEOH™ Process converts a portion of the CO-rich syngas produced by the gasifier to methanol, and the unconverted gas is used to fuel the gas turbine combined-cycle power plant.

The LPMEOH™ Demonstration Project at Kingsport, Tennessee, is a \$213.7 million cooperative agreement between the U.S. Department of Energy (DOE) and Air Products Liquid Phase Conversion Company, L.P., a partnership between Air Products and Chemicals, Inc. (Air Products) and Eastman Chemical Company (Eastman), to produce methanol from coal-derived syngas. A 260- short tons per day (TPD) LPMEOH™ Process Demonstration Facility has been in operation at Eastman's chemicals-from-coal complex in Kingsport, Tennessee since 02 April 1997. Nameplate capacity was achieved on 06 April 1997, and production rates have exceeded 300 TPD of methanol during test periods. Since startup, overall availability has exceeded 98.5%. Eastman has accepted all of the greater than 80 million gallons of methanol produced to date at the LPMEOH™ Demonstration Facility for use in downstream chemical processes.

One of the advantages of the LPMEOH™ Process for coproduction of electric power and methanol from coal-derived syngas is that the as-produced, stabilized (degassed) methanol product is of unusually high quality (e.g. less than 1 wt% water). This stabilized methanol product may be suitable for direct use premium fuel applications. When compared to conventional methanol synthesis processes, cost savings of \$0.04 to \$0.11 per gallon of methanol (including conversion and distillation costs) can be achieved in coproduction facilities. However, the suitability of the stabilized product methanol as a fuel must be demonstrated. A product-use test program was developed to enhance the early commercial acceptance of central clean coal technology processing facilities, coproducing electricity and methanol. The objective of this program was to demonstrate commercial market applications for the "as produced" or stabilized methanol as a replacement fuel and as a fuel supplement. The applications (for example, as a hydrogen source for fuel cells, and as a clean, transportable, and storable fuel for dispersed power) required testing of the stabilized methanol to confirm its suitability. Stabilized methanol produced at the LPMEOH™ Process Demonstration Facility in Kingsport was made available to seven applications selected to participate in this study. The results of the test program are presented in this report. Based upon these results, stabilized methanol from the LPMEOH™ Process can be substituted for chemical-grade methanol in most of the applications without loss of the environmental benefits or degradation in performance. Additional testing would be required to qualify the use of stabilized methanol as the source of hydrogen to a phosphoric acid fuel cell; methanol from the LPMEOH™ Process that is purified to chemical-grade specifications should be suitable for use in this application.

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